

Newark - Division of Water

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ANNUAL REPORT
OF THE
DIVISION OF WATER
FOR
1935

ANNUAL REPORT
OF THE
DIVISION OF WATER

Mr. James W. Costello, Chief Engineer
Department of Public Affairs
Newark, New Jersey

Dear Sir:

The annual report of the various Bureaus of the Division of
Water for the year 1935 is herewith submitted.

Respectfully,

WGB:PM

WILLIAM G. BANK
DIVISION ENGINEER

ANNUAL REPORT
OF THE
BUREAU OF WATER SUPPLY
(DIVISION OF WATER)

BUREAU OF WATER SUPPLY

COVERING

COLLECTING, PURIFICATION, TRANSMISSION AND CEDAR GROVE RESERVOIR

ALFRED B. ANDERSON

ASSISTANT ENGINEER - IN CHARGE

COLLECTION

PRECIPITATION ON PEQUANNOCK WATERSHED

The precipitation on the Pequannock Watershed as determined from the average of observations at three locations, Canistear Reservoir, Oak Ridge Reservoir and Charlotteburg, amounted to 42.46 inches for the year 1935. This is below the normal which for the years of record since 1893 is 48.3 inches. The deficiency was principally during the first half of the year. December, however, was the driest month with precipitation of 1.26 inches.

STORAGE AND DEPLETION - PEQUANNOCK RESERVOIRS

The Pequannock Reservoirs were practically full and overflowing from January 1, 1935 until January 31st, from March 16th until May 18th, and from December 11th until December 24th. The maximum depletion of storage amounted to about 3,500 million gallons and occurred on October 30th. Oak Ridge Reservoir was then drawn down 17.6 feet and Clinton Reservoir 6.2 feet. Canistear Reservoir was full or practically so throughout the year, the only draw-down being the slight amount of less than 1 inch during the last two weeks of October.

WATER DIVERSION

A total of 13,059.9 million gallons of water were diverted from the Pequannock Watershed during 1935 as contrasted with 13,350.1 million gallons in 1934, a decrease of 290.2 million gallons.

From Wanaque Reservoir 7050.0 million gallons of water were taken by Newark in 1935 as compared with 6,629.9 million gallons in 1934, an increase of 420.1 million gallons.

Month by month figures of the amount of the 1935 diversions are shown on the last two columns of Table 1 of this report.

The Pequannock diversion figures differ from the figures of consumption of Pequannock water by the amount of the gain or loss in storage in Cedar Grove Reservoir. The total consumption of Pequannock water as seen in the next paragraph is greater than Pequannock diversion by 31.1 million gallons, which agrees substantially with the net loss in Cedar Grove Reservoir storage during the year 1935.

WATER CONSUMPTION

The total consumption of water in the Newark system for the year 1935 was 20,141.0 million gallons, an average of 55.2 million gallons daily, an increase of 185.6 million gallons or 0.5 million gallons daily, from the 1934 figure of 19,955.4 million gallons total for the year and 54.7 million gallons daily. Of this, 13,091.0 million gallons (35.9 million gallons daily) were from the Pequannock supply and 7,050.0 million gallons (19.3 million gallons daily) from the Wanaque supply; as compared with 13,325.5 million gallons (36.5 million gallons daily) from the Pequannock in 1934, and 6,629.9 million gallons (18.2 million gallons daily) from the Wanaque in 1934.

Of the total 1935 consumption of 55.2 million gallons daily, 45.9 million gallons daily were consumed in Newark and 9.3 million gallons daily were delivered to other systems. For details see Tables No.1 and No.2 of this report.

PEQUANNOCK WATERSHED THOMAS P. BYRNES, SUPERINTENDENT

In addition to the regular routine which was carried out, the following extra work was accomplished:

1. Ditching and draining of Grimsaw Pond.
2. Building of forty new concrete toilet vaults and septic tanks on premises in Zone #1.
3. Razing of house formerly occupied by David Shauger.
4. Painting of houses and building at New City and Charlotteburg.
5. Cutting back brush and opening streams tributary to Canistear and Dunkers Pond.
6. Furnishing piling for use at the Airport.
7. Construction of a garage at the Forester's home.
8. Placing of gates or obstructing the entrances to all legally closed roads within

watershed boundaries.

FIRE PROTECTION

There were eight fires during the year, the first March 26th covering 15 acres and the last October 28th covering one-half acre. A total of 39-1/2 acres were burned over.

BUILDINGS

The city-owned properties were maintained in good repair.

REVENUE

The total revenue from all sources for the year amounted to \$7,510.40.

CIVILIAN CONSERVATION CORPS WORK

In addition to the Civilian Conservation Corps Camp S-54, two additional camps were established during 1935. One of these, located below Macopin Intake Reservoir, began field work on October 8th. The other S-70, located on the Peter Tallman property began work on November 18th. The work done by these camps included:

- A. A total of 155,000 trees planted in the field.
- B. The installation of a sprinkler system in the tree nursery and the care of 2,210,500 seedlings growing there.
- C. Forest stand improvement cuttings on 716 acres and brush burns on 689 acres.
- D. A total of 5.7 miles of truck trails constructed.
- E. The survey of property lines was continued.

SAFEGUARDING AND PURIFICATION

CEDAR GROVE LABORATORY
J.F.D. BAUERMANN
ASSISTANT BACTERIOLOGIST IN CHARGE

The procedures of the American Public Health Association and the United States Public Health Service, supplemented by methods found better adapted to our own supply were followed in the laboratory. The latter methods serve the purpose of checking the former. The following samples from various sources were examined as in the past:

<u>Source</u>	<u>Microscopical</u>	<u>Bacteriological</u>
Station #1 and 2 Great Notch	596	600
Station #3 Cedar Grove Reservoir Effluent	296	300
Station #5 Belleville Reservoir Inlet	3	1
Station #6 Belleville Reservoir Outlet	291	288
Station #7 Wanaque at Belleville	294	295
Station #8 So. Orange Ave. Reservoir Effluent	44	239
Station #9 Central Avenue and Ninth Street	--	54
Station #15 Macopin Intake	41	40
Station #16 Upper Macopin Intake	15	14
Station #17 Echo Lake Brook	37	39
Station #18 Timber Brook	3	1
Station #20 Kanouse Brook	52	177
Station #25 Clinton Brook	56	59
Station #30 Oak Ridge Brook	65	53
Cedar Grove Reservoir Proper	89	--
Oak Ridge Reservoir Proper	26	--
Cotter Pond	1	30
Wallace Pond	10	--
Earl Pond	7	0
Special Samples	22	55
New Pipe Lines	--	47
Stockholm Brook	1	--
Charlotteburg Pond	3	--
Davenport Brook	2	--
TOTAL	1954	2292

CHEMICAL SAMPLES

- 12 Monthly Chemical Analyses complete, of Delivered Pequannock water.
- 2 Samples of Dirt and 1 Sample of Ground Water for Division of Water.
- 1 Sample of Tubercles for Division of Water.
- 1 Sample of Sandy Loam for Division of Water.
- 1 Sample of Wanaque water for City of Elizabeth.
- 1 Complete Chemical Analysis Special.

In addition to the above chemical analyses a large number of pH values were determined and free chlorine, free ammonia, free carbon dioxide, dissolved oxygen and nitrite tests were performed, some as daily routine and others on dirty water problems.

MICROSCOPY

<u>Source</u>	<u>Date Reported</u>	<u>Date Treated</u>	<u>Date Treat. Stopped</u>	<u>Microorganism</u>
Wallace Pond Effluent	Jan. 16	Jan. 17	Feb. 19	Dinobryon, Uroglana
Kanouse in Sections	Apr. 4	Apr. 9 (day)	May 1	Stigeoclonium
Oak Ridge Brook at Dam	Apr. 4	Apr. 9 (day)	Apr. 16	Synura, Melosira, Spirogyra
So. Orange Reservoir Inlet	May 10	May 11	May 11	Algae Growths
Cedar Grove Res. Proper	May 31	June 3	June 3	Daphnia, Cyclops
Oak Ridge Res. Proper	June 28	July 1	July 1	Anabaena, Aphanizomenon
Earl Pond	July 20	Aug. 6	?	Weeds and Protozoan
Clinton Brook	Aug. 6	Aug. 8	Aug. 20	Synura
Belleville Reservoir	Aug. 19	Aug. 20	Aug. 20	Dinobryon

The above locations were all treated with copper sulphate, and in addition thereto a number of smaller places within the watershed proper, were treated with copper sulphate by the watershed force, when found necessary.

Branchipus, which for the last few years have appeared in the distribution system in the spring and fall for a short period, again made their appearance. We have not been able to detect any of the Branchipus in samples taken at the Cedar Grove Reservoir Effluent and our only way of knowing their presence is in the particular locality in which they appear. It is believed that they have embedded themselves within the distribution system at some time and until we carry a residual in the distribution system that they will have a tendency to crop up at seasonal periods.

A new source of trouble appeared this year, in the form of small fish of the shiner variety. They have appeared in numbers in Oak Ridge Reservoir and Macopin Intake. At the Oak Ridge Reservoir overflow many died, giving off foul odors and it might be advisable to net these fish when they appear. It is believed that fishermen used them as bait and they have propagated.

BACTERIOLOGY

The Town of Nutley on March 25th complained to the State Board of Health of the presence of Diarrhoea in the Town, blaming it on the water. An investigation made by the State Board of Health and reported by them on April 8th showed the water was not at fault.

The condition of South Orange Avenue Reservoir was such that on May 21st treatment was again recommended for the summer months. Chlorine and ammonia were added from May 27th to September 19th to this reservoir, resulting in a water free from the Coli-Aerogenes group,

and appearance in quality, excellent.

During June and part of July a number of bacteriological tests were made in the City Distribution system in conjunction with dirty water problems encountered in the late spring each year. The results of these were given in a report at the time.

Each year the City Board of Health has had reason to complain of the bacterial flora of Kanouse Brook. It is known to be polluted and it has been recommended that properties that are a source of pollution be purchased. This year the City Board of Health had not complained, due to the fact that extensive cleaning operations were conducted on Kanouse Brook. In addition, experiments on prechlorination on Kanouse gave the following results:

		<u>Total Gas Tubes</u>	<u>Part Confirmation Coli-Aerogenes Group</u>
Kanouse Brook Raw Water.	Aug.	93.3%	3.3%
	Sept.	84.3%	14.3%
	Oct.	72.6%	7.1%
	Nov.	91.4%	14.3%
Kanouse Brook After Chlorination 200 Feet.	Aug.	36.6%	1.6%
	Sept.	10.0%	0.0%
	Oct.	3.0%	0.0%
	Nov.	53.0%	0.0%
Kanouse Brook at Route 23. After Chlorination	Aug.	100.0%	0.0%
	Sept.	90.0%	3.3%
	Oct.	76.6%	1.1%
	Nov.	60.0%	0.0%

It can be seen from the above results, that, if complaints as to the bacterial flora of Kanouse are received, we can eliminate the coli-aerogenes group, whose source is before that of the point of treatment. As to the total gas tubes, that is, those bacteria that are spore formers and resist chlorine considerably, we can expect a 60.0 to 75.0% drop in the total directly after chlorination. Further down Kanouse stream, after chlorination, it will be noted that the coli-aerogenes group show a negligible increase, but the total gas tubes showed a decided increase. This can be accounted for by the fact, that when a water containing spore formers is chlorinated, these type of bacteria have the power of encasing themselves in a sheath and when conditions are again right they grow more profusely than before. They can be killed by prolonging chlorination by means of chloramines if necessary.

Cotter Pond was likewise chlorinated, but treatment was discontinued due to the lack of proper attention given to it. C.C.H. chlorine powder was the agent used for chlorination of Kanouse and Cotter Pond Effluent during August. In September, October and November, a panel

and chlorine gas was used on Kanouse Brook.

About August 15th, a slight intestinal sickness occurred in the C.C.C. Camp below the Intake. The water supply of the camp was examined and found to be satisfactory.

The Watershed Forester submitted some excrement obtained from the Jersey City Sewage Plant at Boonton. It was to be used in the watershed as a fertilizer, but had to be condemned as a source of danger. This was covered in a report of November 6th.

CHEMISTRY

The routine monthly chemical analyses were made during the year. Routine pH values of the distributed water were determined during the early part of the year.

In January 1935, the City Board of Health complained of Nitrites in Cedar Grove Reservoir Effluent. This condition, as has been previously stated, is not caused by pollution, but is due to a chemical reaction of the ammonia used in sterilization during cold weather; consequently in December of this year, the use of ammonia was discontinued temporarily and no similar further complaints have been referred to the Laboratory.

In June and part of July, field tests were made on the distributed water for Dissolved Oxygen, Free Carbon Dioxide, Free Chlorine, pH Values, Free Ammonia, Nitrites and Manganese to determine what part they may play in giving dirty water, found for a certain period each year. These results were covered in a separate report at the time.

In October chemical tests, similar to some made in 1934, on tubercles and sediment found in our distribution system, were made and reported at the time.

A chemical analysis was made for the City of Elizabeth on November 8th, of a sample of dirty water delivered to it from the Wanaque Supply.

PURIFICATION - CHLORINATION

Ortho-Tolidine tests for free chlorine were made hourly on both pipe lines at Macopin Intake. These are further checked at Great Notch by the laboratory.

From March 11th to 14th an inspection was made, with members of the watershed force, of the toilets in the so-called Zone #1 or red zone.

An inspection of the localities where fecal deposits are buried, was made, on September 30th.

On August 6th an inspection of the main river, from the intake, through Charlotteburg Pond

to the old Echo Lake Railroad crossing, was made, with one of the engineering force, noting the condition of the river in general. This inspection showed the need of improvement in that section on the upper end of Charlotteburg Pond.

South Orange Avenue Reservoir Inflow was chlorinated by means of chloramines from May 27th to September 19th.

For experimental purposes, Manasse Stream was chlorinated from August 8th to November 8th, and Catter Pond Effluent from August 8th to September 12th.

The cleaning of Manasse and the emptying of Grinslow Pond greatly improved the quality of water from this stream.

MANASSE SUPPLY

Daily Bacteriological, Microscopical and Chlorine residuals were made of the Manasse Supply at the Belleville take-off as in previous years.

The water supplied by Manasse was of excellent bacterial quality.

The dirty water that was perceptible in previous years at about the time of the fall turn over was not pronounced as in other years.

A slight odor from microorganisms was noted in the winter months, but could not be considered objectionable.

The City of Elizabeth which obtains Manasse water from Newark complained on April 16th of odor and color. No odor or increased color was noted in our lines.

On November 8th a complaint of dirty water in Elizabeth was reported.

TRANSMISSION LINES AND CEDAR GROVE RESERVOIR

ALFRED B. ANDERSON
ASSISTANT ENGINEER

During the year the usual work necessary to maintain and operate the 62.43 miles of steel transmission pipe lines has continued.

A careful inspection was made each week of the entire system to locate any trouble that might cause interruption to the supply. All air valves were operated to release air collected at the high points on the lines and all other valves and appurtenances were inspected. In the course of this inspection any leaks in the pipe lines were reported and subsequently repaired. During this year 12 such leaks were reported and repaired.

The controlling valves at the following reservoirs were inspected and repaired, Canistota,

Oak Ridge, Clinton, Echo Lake, Macopin Intake and Cedar Grove.

A new basin and trough was constructed at Macopin Intake Gate House for washing screens.

MAINTENANCE OF RIGHT-OF-WAY

The usual work in connection with maintaining the right-of-way was continued this year. Cross ditches for surface water were cleaned, grass on the pipe line right-of-way mowed during the summer months, the gate houses were white-washed, and buildings at Cedar Grove Reservoir were repaired.

NEW CONSTRUCTION (Cement Lining)

Under Contract 34, Pequannock Pipe Line No. 2 is to be cleaned and relined with cement mortar. Work was started on September 29, 1935 and continued through the year. During 1935 a total length of 27,900 lineal feet of pipe line was cleaned, 2,000 lineal feet of 1/4-inch cement mortar lining placed and 1,653 lineal feet of 5/8-inch cement mortar lining placed.

The rough cleaning of the above pipe line was done by the National Water Main Cleaning Company as a sub-contractor to the T. A. Gillespie Company, General Contractors.

City forces prepared six openings in the steel pipe line, 8 feet long, fitting Dresser Couplings to the ends so that the sections could be removed several times. They also controlled all flow through the pipe line during the rough cleaning operations, to prevent any damage to the line.

ENAMEL LINING (Works Progress Administration)

The reconditioning of the uncompleted portion of the No. 2 Pequannock Pipe Line between Brookdale and Belleville, which was started under a Civil Works Administration Project, continued as a Works Progress Administration Project. The interior of the pipe is being coated with Bituminous Enamel. The project started November 14, 1935 and during the balance of the year 2,191 feet of pipe line was cleaned and 1,409 feet wire brushed ready for priming and enameling.

WOOD STAVE LINE

Due to the continued cold weather, considerable trouble was encountered in the maintenance and operation of the wood stave line. At one time the ice on the inside of the pipe was found to be 12-inches thick, reducing the flow to the equivalent of a 24-inch pipe line.

TREATMENT PLANT - MACOPIN

The treatment plant at Macopin has been operating successfully during the year. During the cement lining of the No. 2 pipe line, the wood stave line was put in service with a resulting increase in pressure on the No. 1 line at Macopin. This necessitated the use of the pumping equipment at the treatment plant for several months.

CEDAR GROVE RESERVATION

The usual work in connection with maintaining the grounds on the Cedar Grove Reservation has continued through the year. Mowing of grass on the dams and around the city-owned buildings, together with the transplanting of trees from the nursery, constituted the bulk of the summer work. During the winter, repairs were made to the wire fence enclosing the reservoir and to city-owned buildings on the reservation.

ANNUAL REPORT
OF THE
BUREAU OF DISTRIBUTION
(DIVISION OF WATER)

BUREAU OF DISTRIBUTION

ROBERT O. SCHOLZ, ENGINEER IN CHARGE

ARTHUR J. SIMPSON, ASSISTANT ENGINEER

During the year 1935 it was necessary to curtail all but necessary expenditures by Division of Water forces, for construction and maintenance work over the system. Budget figures were held to an absolute minimum.

The following is a summary of the most important work accomplished by the Bureau of Distribution during the year:

Continuance and completion of Emergency Relief Administration water main project approved in 1934. This work included the following:

Clifton Avenue - New 20 and 24-inch Low Pressure cast iron feeder, between Bloomfield Avenue and Lackawanna Avenue. Completed and placed in service February 2, 1935.

In addition thereto, the following work was started and completed during the year as Emergency Relief Administration Projects:

Central Avenue - New 12-inch Low Pressure main from 9th to 13th Streets, off 20-inch feeder at 9th Street.

Sekland Terrace - Relaying 8-inch Low Pressure main from South Orange Avenue to Cameron Road, replacing old 4-inch main.

North 9th Street - New 10-inch Low Pressure main from Springdale Avenue to 4th Avenue.

State Highway Route 401 (McCartor Highway) - New 12-inch and 8-inch Low Pressure mains, from Lafayette to Mulberry Street.

Green Street - New 12-inch High Pressure main from Mulberry Street to Liberty Street.

Some of the material and practically all of the labor on the above work was furnished from Government aid.

In September of this year, 25 new Project Applications were made to the Works Progress Administration of the Federal Government, covering water main extensions in the system.

In addition thereto 4 applications were made for Service Projects which included

1. Location of all Consumers' Services
and preparation of complete new service maps over entire system.

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2. Leak Detection Survey - This work to include field observations on all services, hydrants, gate valves, etc. over entire system.
3. Hydrant Flow Tests - To determine hydrant capacities over entire system, in advance of new hydrant painting.
4. Hydrant Painting - To clean and repaint all hydrants in new color schemes, as recommended by Water Works Committees on Hydrant Markings, thereby indicating the various hydrant capacities.

The following projects were later approved by Works Progress Administration, work on which was started and carried on during the balance of the year.

State Highway Route #21 (McKarter Highway) - New 12-inch Low Pressure main from Bridge to Clay Streets.

Sandford Avenue - New 12-inch Low Pressure main from South Orange Avenue to Varsity Road. This project is a very important part of necessary feeder extensions to strengthen the Vailsburg section.

Location of Consumers' Services - This project was started with a force of Draftsmen, Clerks and field men.

Considerable material and practically all of the labor on the above work was furnished from government aid.

The work done by the regular forces of the Bureau of Distribution was as follows:

All necessary work, in conjunction with Emergency Relief and Works Progress Administration forces on water main jobs.

This work included supervision, intersection hook-ups, set-backs, service transfers and other skilled work.

Completion and placing in service, of all necessary relays and extensions in the distribution system, both low and high pressure, in connection with the Pennsylvania Railroad Station Improvements.

Year Avenue - New 8-inch Low Pressure main between Clinton Place and Aldine Street.

Hensbury Avenue - New 8-inch Low Pressure main, Aldine Street intersection in advance of pavement.

Brown Street - New 6-inch Low Pressure main extension north of Lister Avenue.

New 4-inch and 6-inch fire line extensions for Bureau of Street Cleaning and Refuse

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Collection on Bay Bridge Refuse Dump.

New 6-inch connection, with check valve, to southerly 16-inch main serving Town of Kearny, at foot of Leaside Avenue. The northerly 16-inch main of the twin river lines, was disconnected on the Newark side, due to numerous leaks under the river. The meter on the southerly line was reversed to record flow to Kearny. Newark pressure now on line for standby emergency service. All main line valves on Kearny side are closed.

In addition the Division Section crews carried on as far as funds would permit their regular inspection, maintenance and repairs on gate valves, hydrants and pressure regulators throughout the system.

Only one major break occurred during the year. On October 15th a section of 20-inch High Pressure cast iron pipe on Alling Street at Edison Place split. No damage was done before a shut off was effected, and after repairs were made, the main was replaced in service.

All record maps were brought up to date and several improvements in methods of keeping accurate records were made.

A regular weekly inspection was made of all recording gauges.

On August 21, due to the presence of Dinobryon, it was necessary to treat Belleville Reservoir. The reservoir was treated with copper sulphate and was placed back in service August 24th. During the period that the reservoir was out of service, Wanaque water was fed directly into the area normally supplied by Belleville Reservoir.

Gas formers again persisted in South Orange Avenue Reservoir and upon recommendation of Mr. J. P. J. Saemann, chloramine treatment of the reservoir, applied during filling operations, was started on May 27th and continued regularly until September 19th with favorable results.

During the year the necessity for replacement of certain sections of water mains on Boreas Avenue and Port of Newark area, badly corroded from acid soil action, was again stressed. This work should be done as soon as finances will permit of same. This replacement work has been made the subject of an application to Governmental Agencies, but at the end of the year it had not been approved.

Flushing - All feeders were flushed during March and April of this year. In general, the water was found in good condition and any real benefits obtained did not justify the expense

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of this operation.

Routine weekly or bi-weekly flushing of dead ends and of areas in the vicinity of laundries and elsewhere where dirty water tends to accumulate, was continued during the year. No extensive flushing was necessary, as in the previous years of 1933 and 1934.

DISTRIBUTION SYSTEM

The total length of pipe owned by the city is now 533.51 miles in the low pressure system and 22.31 miles in the special segregated high pressure fire system. Connected with the mains in the low pressure system are 4,284 fire hydrants and in the high pressure system 326. There are 8,532 gate valves which control the flow of water in the mains of the low pressure system and 245 gate valves controlling the flow of water in the high pressure system. There are 71,481 connections, known as services in the low pressure system, of which 55,183 are in use. Through these, water for domestic, commercial and public use is drawn. There are 303 connections in the high pressure system, of which 269 are in use. The water pressures in the low pressure system range from 30 to 130 pounds and in the high pressure system from 100 to 160 pounds per square inch.

STREET MAIN EXTENSION, LOW PRESSURE SYSTEM

The total extension to street mains in the city during the year 1935 was as follows:

7,756 lineal feet = 1.469 miles from 6" to 30" diameter.

The amount of work done in relaying was as follows:

2,666 lineal feet = 0.505 miles from 8" to 24" diameter.

The total amount of pipe of different diameters, deducting old pipe taken out and adding new pipe of larger size in place of the old pipe removed, consists of 2,816,926 lineal feet or 533.51 miles.

The number of low pressure taps made during the year was 139. Of these 80 were of 1-inch diameter, 17 of 1-1/2 inch, 13 of 2-inch, 3 of 3-inch, 7 of 4-inch and 9 of 6-inch diameter.

The total number of low pressure taps in the city at the end of the year 1935 was 71,481, while the number of taps in actual use was 55,183. The difference shows the services installed in advance of street pavements.

During the year 31 low pressure hydrants were set. Of these 9 were replacements of old hydrants, and 22 were additions to the number already in place; 11 hydrants were taken out and not replaced, making the total number of hydrants in the low pressure system:

In the City.....	4,236
Silver Lake Section and Belleville.....	<u>148</u>
	4,384

STREET MAIN EXTENSION, SPECIAL ASSOCIATED HIGH PRESSURE FIRE SYSTEM

The extension of high pressure mains during the year 1935 was as follows:

1255 lineal feet = 0.238 miles 12" to 20" diameter.

The total amount of high pressure pipe of different diameters on December 31, 1935 was as follows:

149,461 lineal feet = 28.31 miles.

The total number of high pressure taps in the city at the end of the year 1935 was 393, while the number of taps in actual use was 269. The difference shows the services installed in advance of street improvement.

During the year 5 high pressure hydrants were set, of these 1 was a replacement, 4 were added to the number already in place, 3 were taken out and not replaced, making a total of 386 high pressure hydrants in the city. The number of high pressure taps made during the year was 2.

Mr. Frederick G. Scherer, Superintendent of Construction and Maintenance, reports that during the year 1935 there were 16 breaks on mains repaired and that a total of 2,800 leaks covering mains, hydrants and services were investigated and when necessary, repairs were made. Poor pressure complaints investigated totaled 1,176. There were 331 services cleaned out at the main and 1,000 curb boxes set or repaired. A total of 868 hydrant repairs were made, this high percentage of the entire system being accounted for by improper and unauthorized use together with a more comprehensive inspection and maintenance schedule.

Mr. Arthur H. Stemmler, Chief Plumbing Investigator, in charge of the Bureau of Inspection, reports as follows:

Special investigations were made by the Bureau of Inspection investigating buildings and plants whenever illicit distilleries were raided by the Federal Authorities. The investigators found that in eighteen (18) of the plants raided either water connections were taken off on the street side of the water meter or new direct connections to the water main were made by tunneling. Water bills amounting to several thousand dollars were made out against the owners of the properties and liens placed or filed.

Surveys and drawings of the water pipe layouts in manufacturing plants and service connections to buildings are being made and records in the form of maps are being completed and brought up to date for use by the Division of Accounts. Thousands of dollars of omitted accounts are now being added to the records. Water services marked in ledgers "dead or water off" have been found alive and in use. In addition thereto unmetered high and low pressure fire hydrants not charged for years have been discovered to be in use as other connections inside the property. Inspection is made of all new services as to their proper installation, also of all repaired and relaid services.

In addition to the above the following work has been accomplished during the year:

Out of Town meter readings	1,099
Meter Inspections	2,928
Service Inspections	586
Special Investigations	4,772
Special Readings	211
Mason and Building Inspections	2,786
Water Searches	43
By-passes Sealed	94
Unmetered Fire Service Inspections...	1,417
Tap Inspections.....	122
Surveys and Drawings	
Total 132 covering	886 Taps.

Twenty-three (23) water meters supplying other municipalities are read weekly.

Special efforts were made to locate foreign water connections between the city water supply and private systems. Fourteen (14) connections were found and removed by owners.

METER LABORATORY

The Meter Laboratory located at 332 South 8th Street, Newark, N. J. is responsible for the servicing and proper functioning of every water meter on Newark water lines. It also keeps an invaluable record of each meter, giving in detail, its location, size, make and number and a record of all tests, repairs and charges from the original date of purchase until it is scrapped.

Its staff on December 31, 1935 consisted of 21 men made up of clerks, repairmen, mechanics, chauffeurs and laborers.

There were 9,380 meters serviced in varying degrees and covering the range of sizes and makes in service, a detail of which work follows:

1155 damaged by frost
 1855 stuck (various causes)
 180 damaged by heat
 2702 miscellaneous (tests, glass, lids, etc.)
 1179 inspections
 1409 special readings
 373 periodic tests
 173 minor repairs
 220 sealed registers
 166 sealed couplings

In addition thereto 554 new meters were tested and 170 meters were condemned due to excessive wear, damage and obsolescence.

The stock room inaugurated during the latter part of 1934 functioned satisfactorily during the year. Meter parts and general supplies are in charge of one man, who is responsible for their disposition and replenishment. He is also charged with the receiving of all material and the handling of shipping when necessary. This department has been an outstanding need for years and should result in a substantial saving in that all drafts made on the stock room must be properly accounted and charged for. It prevents pilfering and enables us to anticipate our requirements more accurately. It also eliminates running out of necessary parts and materials and the attendant confusion.

A new oil burner for the heating plant installed during the fall of 1935 and the enlargement and refitting of the steam mains and branches, have improved the heating of the building to a degree heretofore unknown. This burner, being more efficient should show a corresponding saving in fuel consumption.

Periodic field testing of meters, 2-inch and larger, was continued during the year and when time permits periodic testing of smaller meters is carried on by Meter Laboratory forces.

Closer cooperation has been secured through conferences with and exchange of weekly reports between the Accounting Division, including meter readers and investigators, and the Meter Laboratory and meter testing crews.

A new card system, listing the names and signatures of licensed plumbers was inaugurated during the year. This affords a complete check on the handling of all meters either new or reconditioned, over the signature of a regular licensed plumber, which is required under our rules and regulations.

CONTRACTORS' ACCOUNTS covering METER READING, BILLING AND COLLECTING, are included in a separate report submitted by the Chief Accountant of the Department of Public Affairs.

TABLE I.

CONSUMPTION STATEMENT FOR YEAR ENDING DECEMBER 31, 1935.

1935						
MONTH	Total Consumption per month. Million Gallons - Newark - Belleville - Bloctfield - Elizabeth - Watley - Kearny Elizabeth - Water Company - Overbrook Hospital. Essex County, Verona.	Average Daily Consumption Million Gallons Newark and Suburbs.	Total Consumption per month. Million Gallons Newark.	Average Daily Consumption. Million Gallons Newark.	Average Temperature Newark.	Rainfall - inches Newark.
January	1713.9	56.3	1400.2	45.2	29.2	4.91
February	1561.3	55.6	1272.8	45.4	31.8	4.04
March	1663.8	53.7	1368.0	44.1	43.9	2.06
April	1616.7	53.9	1344.4	44.8	48.8	1.63
May	1674.7	54.0	1392.3	44.9	59.7	1.13
June	1681.7	56.1	1403.7	46.8	70.2	5.05
July	1810.2	58.4	1529.3	49.3	74.8	5.22
August	1818.5	58.7	1536.9	49.6	74.9	2.72
September	1614.0	53.3	1355.3	45.2	64.8	3.66
October	1684.4	54.3	1423.4	45.9	58.8	2.13
November	1601.5	53.4	1327.7	44.2	47.5	5.97
December	1708.3	54.3	1393.6	45.1	29.8	2.86
TOTAL	20141.0	602.2	16792.9	560.5	630.4	41.08
AVERAGE		55.2		45.9	52.5	3.42

Estimated Population of Newark by Board of Health, December 31, 1935 - - - 455,000

Estimated Population of Town of Belleville, Board of Health, December 31, 1935 - 23,000

A vertical strip of 20 small, square images showing various stages of a plant's growth, from a seedling to a mature plant with leaves and flowers. The images are arranged in a single column, with each image showing a different developmental stage of the plant. The plants are shown in various colors, including green, yellow, and brown, and are set against a white background. The images are arranged in a way that shows the progression of the plant's growth from left to right, with the seedling on the far left and the mature plant on the far right.

	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
Wilmington	1.3	1.3	1.5	1.3	1.4	1.3	1.2	1.4	1.4	1.3	1.2	1.4	16.0
Wilmington	96.0	96.0	96.0	91.7	93.2	97.9	103.4	102.8	97.3	102.4	117.1	123.6	1200.7
Wilmington	114.7	103.3	112.0	104.7	113.5	114.6	109.6	114.7	111.0	95.1	95.9	102.5	1200.5
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Wilmington	1.3	1.3	1.5	1.3	1.4	1.3	1.						

DIVISION OF WATER
SUMMARY OF STATISTICS OF THE NEWARK
NEW JERSEY, WATER WORKS

For Year Ending December 31, 1935.

Population by census, 1930.....	440,000
Date of construction.....	1889-1891
By whom owned.....	City of Newark
Source of Supply.....	Paquanneck and the Manaque Watersheds
Mode of Supply.....	Gravity

STATISTICS OF CONSUMPTION OF WATER

Population, City of Newark.....	455,000
Consumption, for the year, City of Newark.....	16,752.0 m.g.
Consumption, for the year, Town of Belleville.....	632.3 m.g.
Consumption, for the year, Town of Bloomfield.....	1,300.5 m.g.
Consumption, for the year, Town of Elizabeth.....	1,208.7 m.g.
Consumption, for the year, Town of Hatley.....	124.8 m.g.
Consumption, for the year, Township of Wayne.....	29.5 m.g.
Consumption, for the year, Paquanack Lake.....	28.4 m.g.
Consumption, for the year, Elizabethtown Water Company.....	16.0 m.g.
Consumption, for the year, East Orange.....	0.3 m.g.
Consumption, for the year, Verona, Overbrook Hospital.....	48.1 m.g.
Consumption, for the year, Town of Kearny.....	0.4 m.g.

Total Consumption for the year.....20,141.0 m.g.

Passed through meters in the city.....	14,293.51 m.g.
Percentage of consumption metered in the city.....	85.32 %
Average daily consumption, city and suburbs.....	55.2 m.g.
Average daily consumption in the city.....	45.9 m.g.
Gallons per day to each inhabitant in the city.....	100.57
Gallons per day to each tap in use in the city.....	827.87
Cost of supplying water per million gallons figured on total maintenance.....	\$74.57
Total cost of supplying water per million gallons figured on total maintenance, plus interest on bonds.....	\$125.14

STATISTICS REGARDING DISTRIBUTION SYSTEM

Mains, Low Pressure System

Kind of pipe.....	Cast iron and steel
Sizes from.....	4-inch to 60-inch
Extended.....	7,786 feet during year
Discontinued.....	966 feet during year
Total now in use.....	933-2,626/5,280 miles.
Number of hydrants added during the year.....	25
Number of hydrants discontinued during the year.....	11
Number of hydrants replaced with new or reconditioned hydrants.....	9
Number of public hydrants now in use.....	4,294
Number of stop gates added during the year.....	22
Number of stop gates now in use.....	8,032
Range of pressure on distributing mains.....	30 to 130 lbs.

Mains, High Pressure System.

Kind of Pipe.....	Cast Iron
Sizes from.....	6-inch to 30-inch
Extended.....	1,255 feet during year
Total now in use.....	23-1,621/5,200 miles
Number of hydrants added during the year.....	1
Number of public hydrants now in use.....	333
Number of stop gates added during the year.....	2
Number of stop gates now in use... (Revised list over system).....	257
Range of pressure on high pressure system.....	100 to 160 lbs.

Services, Low Pressure System.

Kind of Pipe.....	Lead, brass and cast iron
Sizes from.....	5/8-inch to 6-inch
Total number of services in the City, January 1, 1935.....	71,436
Total number of services added during 1935 (5/8-inch to 6-inch Diameter).....	139
Total number of services abandoned during 1935.....	94
Total number of services in City, January 1, 1936.....	71,481
Total number of regular services in use January 1, 1936.....	54,421
Total number of regular services in use metered January 1, 1936.....	53,390
Total number of regular services in use unmetered January 1, 1936.....	323
Percentage of regular services in use metered January 1, 1936.....	98.43%
Total number of fire line services in use January 1, 1936.....	737
Total number of fire line services in use metered January 1, 1936.....	90
Total number of fire line services in use unmetered January 1, 1936.....	677
Percentage of fire line services in use metered January 1, 1936.....	11.74%

Connections, High Pressure System.

Kind of Pipe.....	Cast Iron
Sizes	1-1/2-inch to 6-inch
Number of connections added during the year.....	2
Number of connections in the city.....	303
Number of connections in use (1-1/2-inch to 6-inch).....	299
Number of meters added.....	0
Revised list of meters now in use.....	115
Percentage of connections in use metered.....	45.37%

ANNUAL REPORT
OF THE
BUREAU OF ENGINEERING
(DIVISION OF WATER)

BUREAU OF ENGINEERING

JAMES E. GARRATT

DESIGNING ENGINEER

GENERAL PLANNING

RELINING NO.2 PEQUANNECK CONDUIT, MACOPIN TO POMPTON NOTCH - The first contract for work in accordance with the Program of Pequannock Transmission Aqueduct Work adopted in 1934 and presented in the 1934 Annual Report, was started late in the fall of 1935. The work, which at the end of the year was well under way, consists of the cleaning and relining of about 30,000 linear feet of the No.2 Pequannock Pipe Line between Macopin and Pompton Notch. It was first proposed to clean this 48-inch riveted-steel line using labor supplied from the Emergency Relief Administration, and then by contract, to line the pipe with cement-mortar placed by centrifugal machine. Specifications for the lining work were prepared early in the year; authorization to obtain bids was obtained April 10th; advertisement for bids for Contract 33, covering this work was issued April 18th; and bids were received on April 29, 1935. Four bids were received. The low bidder was the National Granite Contracting Company who submitted a ridiculously low bid. The unreasonableness of this bid, with the further complication of the difficulty of trying to clean the line by Emergency Relief Administration labor, caused the rejection of all bids, on June 5th.

Authorization to proceed by contract with the cleaning, as well as the relining of the pipe was obtained that same day. Contract 34 for this work was advertised July 24th; bids were received August 5th; contract was awarded August 7th to the T.A. Gillespie Company, the lowest of three bidders for a price of \$5.55 per linear foot or \$166,500 for the 30,000-foot section; and contract was executed August 15, 1935. Work was not started until September 19th, as the line could not be shut

down until the summer peak of consumption had passed. By the end of the year the entire section had been rough cleaned, about 15,000 feet of line had been hand cleaned ready for lining and 4,137 feet of lining had been placed. For details of this work see report on Transmission Lines.

RECONDITIONING 42-INCH LINE TO BELLEVILLE RESERVOIR - To complete the work of reconditioning the portions of the two original Pequannock Lines from Broad Street, Bloomfield to Belleville Reservoir, which was carried on for a few months in the spring of 1934 as a Civil Works Administration project, application was made September 9, 1935 to continue this work under the Works Progress Administration. The reconditioning work was approved November 13, 1935 as Work Project #3-110. Work began on November 15th. By the end of the year sections of the pipe were cleaned and ready for relining but no lining was placed.

60-INCH ALEXANDER AVENUE CONNECTING AQUEDUCT - Study continued from time to time during the year of the proposed 60-inch Alexander Avenue Connecting Aqueduct but due to lack of funds for new construction, no work was contracted for. Test pits were dug along the proposed line to locate rock. Location of easterly end was revised to avoid, as much as possible, the crossing of private property. This makes necessary a somewhat longer line located in Broad Street, Bloomfield, and along the Wanaque right-of-way to the 42-inch and 48-inch Pequannock lines. Plans and specifications have progressed to the stage that contract for the work could be let on short notice should money become available for it.

WATER AUTHORITY

Agitation for legislation to create a Water Authority, or other state agency to coordinate, develop and administer the water-supply resources of the state continued during the year with several bills proposed from time to time. No evident progress was made with the problem. The need of some Authority to as-

sure an adequate supply of water to each community and to require that such community pay its fair share of the cost of providing such water was brought out very clearly and to Newark's disadvantage in the case of the loss of Nutley as a customer. Because of the Passaic Valley Water Commission's offer to supply water to Nutley at \$78.00 per million gallons, that town is now obtaining water at less than the fair cost of providing the same.

SUPPLIES TO OTHER MUNICIPALITIES

NUTLEY - The Town of Nutley was lost as a water customer of Newark during the year. On April 26, 1935 the Town stopped taking Pequannock water and began to take Manaque water from the Passaic Valley Water Commission. This was as a result of Newark's efforts to obtain more than the \$90.00-per-million-gallons price of the former contract, and the Valley Commission's offer to supply water to the Town at a price of \$78.00 per million gallons. The Valley Commission's request for the approval of a contract to supply Nutley with Manaque water at a price of \$78.00 per million gallons was the subject of a hearing at Trenton on March 13, 1935 before the State Water Policy Commission. That Commission was without authority to pass upon the price which should be charged for water. The contract was approved, whereupon the City of Newark instituted suit in Chancery Court during September 1935, asking that the contract be voided. No action has been taken as yet by the Court.

BLOOMFIELD - The Town of Bloomfield made changes in its connection at Broad Street and Bloomfield Avenue during the summer of 1935. A venturi meter of larger capacity was installed with electrical transmission of the recordings to the Town Engineer's office in the Town Hall. A 12-inch connection to an existing branch off the 60-inch steel line was installed to supply water at this location while the meter was being replaced and to serve as a by-pass for this meter in the future. Meter changes are contemplated at the two other connections, namely Grove Street and Carrabrant Avenue.

HYDRANT SPRINKLERS - The recently inaugurated radio-patrol policing proved effective in reducing the promiscuous and unauthorized use of fire hydrants for street bathing during the hot weather of the summer of 1935. Permission to use a hydrant with a sprinkler-shower attachment under proper supervision was issued to 75 persons from the second week in July to September 9th when permits expired and sprinklers were recalled.

CHLORINE AND METER HOUSE, VALLEY ROAD - Study and preliminary lay-out was made of a chlorine and venturi meter house at the location of the present venturi on the 60-inch line out of Cedar Grove Reservoir just east of the tunnel portal and just west of Valley Road, Upper Montclair. The application of chlorine and ammonia to a future additional line as well as to the existing line, and the measurement of flow in each by up to date recording mechanisms, is provided for.

USE OF WANAUKE SUPPLY - The possibilities of using Wanaque water, in an emergency, in the South Orange Avenue Reservoir level was investigated and the procedure was outlined. At present this can be done but in the future, as increasing drafts in the Wanaque Aqueduct pull the gradient at Belleville Reservoir down to 230 or less, this will be impossible.

Study was also made of the possible saving in the use of Wanaque water and more complete utilization of Pequannock water upon the completion of various portions of Pequannock Aqueduct reconditioning which will permit of bringing greater quantities of Pequannock water to the city.

RECORDS

PEQUANNOCK PROPERTIES - Maps of the individual city-owned properties on the Pequannock Watershed were about 70 percent completed during 1935. The services of an Emergency Relief Administration draftsman were used until early in September. Titles to these properties were searched. Maps of the individual Pipe Line rights-of-way were started and are about 60 percent completed.

A tax study on watershed and pipe line properties was completed in connection with which, 100 tax appeals were prepared and filed in West Milford Township requesting reduction of about \$400,000 in assessments.

An inventory was prepared of all buildings owned by the Division of Water in order to determine their values for purpose of fire insurance.

VALVE AND HYDRANT DRAWINGS - Additions to the drawings of details of valves and hydrants were made during the year. High-pressure valves, 6, 8 and 12-inch in size, were completed; also drawings of 20, 36 and 42-inch low-pressure valves and 6-inch by-pass for the same. Details of high-pressure hydrant, on one large drawing was prepared.

OPERATING MAPS - Operating maps and records were revised and expanded from time to time during the year to keep up with changes in the system. The principal addition this year was a set of six drawings showing plan and profile of each of the Pequannock transmission lines from Macopin to Belleville Reservoir. Record drawings of the 60-inch Bloomfield Avenue line from Cedar Grove Reservoir to the tower were in progress at the end of the year.

WATER STATISTICS - Tabulations of rainfall, runoff, temperature, water consumption, chemical characteristics of water and other statistics pertaining to the water supply were kept up to date and in form for distribution to interested parties.

HISTORY OF NEWARK'S WATER SUPPLY - From early annual reports of the Newark water-supply boards and from other historical sources, a rather complete story of Newark's water supply development was compiled. Mimeographed copies of this history, with a lithographed map of the city and its water-supply areas, were prepared in pamphlet form. Hundreds of these pamphlets have already been distributed to school children and to others interested in the subject.

PHOTOGRAPHIC LABORATORY

The work done in the Photo Laboratory during the year 1935 again showed